



**UNIVERSITY OF COLOMBO, SRI LANKA**



**UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING**  
**DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)**



*Academic Year 2010/2011 – 3<sup>rd</sup> Year Examination – Semester 6*

***IT6203 - Systems and Network Administration***

*Structured Question Paper*

**30<sup>th</sup> August, 2011**

**(TWO HOURS)**

**To be completed by the candidate**

BIT Examination Index No: .....

**Important Instructions:**

- The duration of the paper is **2 (Two) hours**.
- The medium of instruction and questions is English.
- This paper has **4 questions** and **10 pages**.
- **Answer All questions.** All questions carry **equal marks**.
- **Write your answers** in English using the space provided **in this question paper**.
- Do not tear off any part of this answer book.
- Under no circumstances may this book, used or unused, be removed from the Examination Hall by a candidate.
- Note that questions appear on both sides of the paper.  
If a page is not printed, please inform the supervisor immediately.
- **Non-programmable Calculators may be used.**

**Questions Answered**

Indicate by a cross (×), (e.g.  ) the numbers of the questions answered.

To be completed by the candidate by marking a cross (×).	Question Numbers			
	1	2	3	4
To be completed by the examiners:				

- 1) (a) What is meant by a *proprietary* software license? Give three (3) examples of such licenses.

(6 marks)

**ANSWER IN THIS BOX**

Proprietary software is computer software licensed under exclusive legal right of the copyright holder. The licensee is given the right to use the software under certain conditions, but restricted from other uses, such as modification, further distribution or reverse engineering.

Examples: (any 3 of the following)

Microsoft Windows, Adobe Flash Player, Adobe Photoshop, Google Earth, Mac OS X, Skype, WinRAR or others

- (b) Consider the following line extracted from a UNIX password database.

**saman:x:501:500:Saman Silva:/data/u501:/bin/tcsh**

- (i) Identify the user's home directory and his login shell of the above entry.
- (ii) What is the command required to change the default shell to another?
- (iii) How can the system administrator temporarily block Saman logging into the system without deleting his password database entries?

(6 marks)

**ANSWER IN THIS BOX**

(i) Home Directory: /data/u501

Login Shell: tcsh

(ii) Use the command:

**chsh -s <new-shell>**

(iii) System administrator can change Saman's default login shell to /sbin/nologin. This will block the user logging into the system until this entry is changed to a proper login shell.

- (c) The *aspell* command is an interactive spell checker utility available on Linux distributions. What is the functionality of the following command when file1 and file2 are text files?

```
$ aspell list <file1 >file2
```

(4 marks)

**ANSWER IN THIS BOX**

The *aspell* command will check all words in thefile1 and any words with spelling mistakes on that will be written/ overwritten to the file2.

- (d) What is the command the system administrator needs to execute to print the top 10 users (their user names) who have used the disk space in /home directory? Assume that all users' data are in the /home/**username** directories.

(5 marks)

**ANSWER IN THIS BOX**

```
du /home --max-depth=1 | sort -rn | head -11
```

or

```
du /home --max-depth=1 | sort -n | tail -11
```

- (e) Answer the following with regards to file access permission.

- (i) Write down the command to set the permission of the file **MyScript.pl** as: *read* (user and group), *write* (user) and *execute* (user, group and other).
- (ii) What can and what cannot be done when a directory is having “*write*” and “*execute*” permission for the user?

(4 marks)

**ANSWER IN THIS BOX**

(i) `$ chmod 751 MyScript.pl`

(ii) User can go into the directory and write files but he cannot list them since he does not have read permission.

- 2) (a) You are given a PC with two network interface cards. Write down the steps to show how you will convert this PC to a Linux based software router to forward data packets from 10.16.100.0/24 network to 192.168.200.0/24 network. However this software router should forward only ssh packets.  
*Note: Exact syntax of the commands is not required.*

(5 marks)

<b><u>ANSWER IN THIS BOX</u></b>
1. Each NIC card should be configured with its IP address. That is NIC card 1 with 10.16.100.254/254 and NIC card 2 with 192.168.200.254/24 using the ifconfig command.
2. Enable the IP packet forwarding feature by updating the file: Set the file /proc/sys/net/ipv4/ip_forward to 1 (OR Set net.ipv4.ip_forward in /etc/sysctl.conf to 1)
3. Enable IPTable on this PC and write rules to enable only for ssh packets.
<code>iptables -A INPUT -p tcp --dport 22 -j ACCEPT</code>
<code>iptables -A OUTPUT -p tcp --sport 22 -j ACCEPT</code>

- (b)
- (i) Write down the command to mount a USB flash disk mapped to /dev/sdb1 to the mount point on /mnt/usb.
  - (ii) How do you make a USB flash disk automatically mount (without using /etc/fstab) when it attaches to a Linux machine?

(5 marks)

<b><u>ANSWER IN THIS BOX</u></b>
(i) Mount /dev/sdb1 /mnt/usb.
(ii) It is by auto mounting usb flash drive on a Linux system by using udev and pmount, or by using HAL/dbus daemon.

(c) Consider a system having the following two hard disks, with the layout as shown below.

sda1	NTFS (75GB)	sda1	NTFS (75GB)
sda2	NTFS (75GB)	sda2	NTFS (75GB)
sda3	NTFS (75GB)	sda3	NTFS (75GB)
sda4	Free (75 GB)	sda5	Free (75 GB)
<b>Disk A</b>		<b>Disk B</b>	

(i) Three partitions of each of the disks are used for Windows operating system and one 75GB partition of each of the disks is free for a new operating system installation. If the Linux installation requires four partitions (root, boot, swap and home) for its installation, which of the disks is more suitable for this task? Justify your answer.

**(4 marks)**

**ANSWER IN THIS BOX**

~~Disk B: The free partition of Disk A is a primary partition and we cannot create four partitions on that. Since Disk B is an extended partition, we can create the required number of logical partitions there and allocate the four partitions.~~

(ii) Write down how you will allocate the 75GB free disk space for the four partitions required for a Linux Installation on a PC with 1GB of RAM. Also write down the file system type that you will assign for each of these four partitions.

**(6 marks)**

**ANSWER IN THIS BOX**

~~The four partitions will be allocated as follows.~~

~~/boot (Boot partition) 200MB and EXT2 file system type~~

~~/swap (Swap partition) 2GB internal to the Kernel~~

~~/home (Home partition) 25GB and EXT4 file system type~~

~~/ (Root partition) Rest of the space and EXT4 file system type~~

- (d) State two (2) advantages one can gain by setting up a Samba server in a Linux environment.

(5 marks)

<p><b><u>ANSWER IN THIS BOX</u></b></p> <p>1. It allows the Samba applications to interface into Microsoft networks to provide interoperability across the systems.</p> <p>2. All of the printing resources share permissions and user account details can be maintained by the Linux Samba server.</p>
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- 3) (a) Write down four (4) advantages of a caching proxy server.

(4 marks)

<p><b><u>ANSWER IN THIS BOX</u></b></p> <p>1. Act as the NAT device: All private IP will be mapped to public IPs</p> <p>2. Caches most frequently accessed data, hence reduce bandwidth usage</p> <p>3. Local policies can be applied to users</p> <p>4. Access pattern can be monitored and log analysis tools can provide that information graphically.</p>
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- (b) Write down a squid access control list (ACL) to block web site URLs which contains the word "casino". Assume that there are no other ACLs existing in the squid.conf file.

(6 marks)

<p><b><u>ANSWER IN THIS BOX</u></b></p> <pre>acl CASINO url_regex casino http_access deny CASINO http_access allow all</pre>
--

- (c) You are asked to add the following information as resource records to a DNS database for a domain called “sagaraya.lk”. The following IP addresses are reserved for various network services.

Service	IP Address	Machine Name
DNS	199.155.100.1	ship
Web	199.155.100.4	boat

- (i) Write a resource record to map the URL `http://www.sagaraya.lk/` to the web server IP address.
- (ii) All mail sent to `user@sagaraya.lk` will be handled by the Mail server **ship** and when **ship** server is out of service, all mail will be handled by the backup mail server `mail.ahasa.lk`. Write down the resource record(s) to accept mail to the domain `sagaraya.lk`.

(6 marks)

<b>ANSWER IN THIS BOX</b>					
..... (i) ..... <code>www.sagaraya.lk</code> ..... IN ..... A ..... <code>199.155.100.4</code> .....					
..... (ii) .....					
	<code>ship</code>	IN	A	<code>199.155.100.1</code>	
	<code>sagaraya.lk.</code>	IN	MX	10	<code>ship</code>
		IN	MX	20	<code>mail.ahasa.lk.</code>
.....					
.....					

- (iii) A Domain Name Server (DNS) can be configured in various ways to resolve a domain name to an IP address. List down four (4) types of DNS configurations.

(4 marks)

<b>ANSWER IN THIS BOX</b>
1 Primary Server
2 Secondary Server
3 Caching Server
4 Stub Server

- (d) Answer the following with regard to Apache web server configuration.
- (i) Write down a command to check whether an Apache server is running on a Linux machine.
  - (ii) You are being asked to change the default port (80) of the current web server to port 8080. Write down the steps to be taken in order to achieve the modification.

(5 marks)

**ANSWER IN THIS BOX**

(i) `$ /etc/init.d/httpd status OR $ ps aux |grep httpd`

(ii) 1. Open httpd.conf file.

2. Change the Listen directive value from 80 to 8080 and save the configuration file.

3. Check the validity of the configuration with

`$ apachectl configtest`

4. Restart the apache server with:

`$ /etc/init.d/httpd/restart`

- 4) (a) In Linux, routine tasks can be automated using “cron” jobs.

- (i) What is the outcome of the following cron job?

`0 2 1 */2 * /usr/local/etc/backup.sh`

- (ii) What command should the system administrator use to add this to the system cron job?

(5 marks)

**ANSWER IN THIS BOX**

(i) This will run /usr/local/etc/backup.sh script at 2AM on the first day of the month in every other month.

(ii) `crontab -e`

(b) Answer the following with regard to mail servers.

- (i) List three (3) popular open source mail server daemons?
- (ii) Write down two (2) features of a mail server daemon other than transferring mail from one server to another.

(5 marks)

<b>ANSWER IN THIS BOX</b>
(i) Popular Mail server daemons: (Any three of the following)
sendmail, qmail, postfix, exim, zmailer,
(ii) (a) It can filter spam mail based on various filtering rules.
(b) It can integrate with anti-virus tools to scan email attachments.

(c) Explain the functionality of each of the following commands in Unix.

- (i) `find /home/ -atime +90 -exec /bin/rm { } \;`

(4 marks)

<b>ANSWER IN THIS BOX</b>
Find all the files in the /home directory that were accessed more than 90 days ago and delete them from the system.

(ii) `tar -xvf backup.tar /home/asitha`

(4 marks)

**ANSWER IN THIS BOX**

Backup tar file will be extracted to the /home/asitha folder.

(d) The following is a Bash shell script and each line is numbered for easy referencing. Explain the functionality of the code by highlighting each line's role in this script.

- (1) `#!/bin/bash`
- (2) `TGT="bak";`
- (3) `cd /etc`
- (4) `for file in *.conf;`
- (5) `do`
- (6) `cp $file $HOME/backup/$file.$TGT;`
- (7) `done`

(7 marks)

**ANSWER IN THIS BOX**

(1) The very first line, often called 'shebang' (!) should precede any other line to assure that the right shell is invoked

(2) Defining the variable TGT with its value "bak"

(3) Change directory to /etc since the file we refer to is there.

(4) For loop definition and variable called "file" will contain each .conf file.

(5) Do start of the loop.

(6) Copy the found .conf files to the backup directory of the HOME directory of the user who runs this code:

(7) Done will end the for loop.

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